

**INFLUENCE OF DISCOVERY LEARNING STRATEGY OF ICT
(INFORMATION AND COMMUNICATION TECHNOLOGY) TOWARD
MATHEMATICS LEARNING OUTCOME BASED ON
MATHEMATICAL CONNECTION**



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By:

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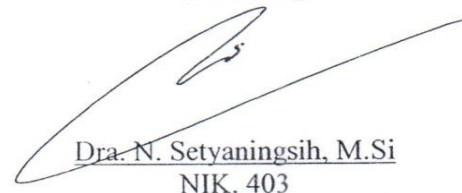
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**IMPLEMENTATION OF DISCOVERY LEARNING STRATEGY OF ICT
(INFORMATION AND COMMUNICATION TECHNOLOGY) TOWARD
MATHEMATICS LEARNING OUTCOME BASED ON
MATHEMATICAL CONNECTION**

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ABSTRACT

The research aims to describe and analyze: (1) the effect of mathematics learning with Discovery Learning strategy and Discovery Learning strategy of Information and Communication Technology (ICT) toward mathematics learning outcome, (2) the effect of student's mathematical connection toward mathematics learning outcome, (3) the interaction between learning strategy and student's mathematical connection toward mathematics outcome. The type of the research is experiment with quasi experimental design. The population of the research was all students of VIII Grade of SMP N 2 Kartasura of odd semester of academic year 2015/2016. The research sample consisted of two classes. The sampling technique use cluster random sampling. Methods of data collection use test and documentation. Data analyzed by analysis of variance with two different cell lines. The results of data analysis with a significance level of 5% was obtained: (1) there is effect of Discovery Learning strategy and Discovery Learning strategy of Information and Communication Technology (ICT) toward mathematics learning outcome, with $F_A = 5,151$ (2) there is effect of student's mathematical connection toward mathematics learning outcome, with $F_B = 20,649$ (3) there is no interaction between Discovery Learning strategy and Discovery Learning strategy of Information and Communication Technology (ICT) based on student's mathematical connection toward mathematics learning outcome, with $F_{AB} = 0,230$.

Keyword: *Discovery Learning, ICT, Mathematical Connection, Mathematics Learning Outcome.*

Introduction

The education in Indonesia is growing in line with the development of technology and information. Therefore, the educational quality continually improved through educational renewal. Efforts to improve educational quality is never apart from good educational environment in the family, school and community. It is stated in Law No.

20 of 2003 on national educational systems that education is a consciously effort and be planed to create an atmosphere of learning and learning process in order that learners can develop their potential actively to have the spiritual power of religion, self-control, personality, intelligence, noble character, and skills needed for them, society, nation, and state.

But in fact, learning outcomes in Indonesia is not accordance with the expectations, especially in mathematics learning. Student outcomes in mathematics are low in rank. This is shown by the Indonesian learning achievement in international arena. Based on data from Trends in Mathematic and Science Study (TIMSS) in 2003 mention that Indonesian learning achievement is significantly below the international average ranking to 35 from 46 countries. Whereas, in Trends in Mathematic and Science Study (TIMSS) in 2007 mention that Indonesian mathematics achievement was ranked 36 out of 49 countries (<http://litbang.kemendikbud.go.id>). Based on the survey results in National Center for Education Statistics in 2011, Indonesian level was 119 to 132 countries in mathematics outcome (Department of Education, National Center for Education Statistics, 2011).

TIMSS 2011 study showed that there were no Indonesian students could work with advanced benchmark question, only two percents Indonesian students could work with high benchmark question, only 15% of them could work with intermediate benchmark, and 43% Indonesian students could work with low benchmark. It shows that Indonesian students quite well in resolving issues relating to basic skills, but Indonesian students generally weak in solving problems that require the ability to think critically, analyze, draw conclusions, and it requires reasoning.

The one of solution to overcome the problems above, by implementing innovative learning strategies and learning strategy that can enhance students' creative thinking skills. Discovery Learning strategy based on Information and Communication Technology (ICT) is one of the learning strategy that focuses on the ability of learners to discover things through research in a structured and well-organized (Ilahi, 2012: 30). According to Gora and Sunarto (2010: 25) ICT (Information and Communication Technology) function as learning media in the same manner as props. In the application of Discovery Learning strategy based on ICT, learners are not only required to find

something or get a new experience, but also involves the ability to solve a problem by thinking carefully and systematic by utilizing the facilities or learning media based on ICT.

In addition to learning strategies are used, the ability of students' mathematical connections also play a role in the success of the learning process (Sulistyaningsih, et al, 2012: 122). According to Kusuma (in Ainun, 2014: 8) the ability of mathematical connection defined as the ability to relate each concept in mathematics internally related to mathematics (itself) or connection externally, namely mathematics with other field, other field of education, or the connection between daily life. When students connect ideas, principles, and concepts in mathematics, student's mathematical comprehension will be profound and more durable, because students being able to see the connection between the topics in mathematics. Through the understanding of mathematical concepts, students are expected to carry out an optimal learning and provide a satisfactory learning outcomes. Thus, students mathematics outcome will be better and have a certain quality. The difference of students ability in mathematical connection influential on students mathematics outcome. By knowing the difference of mathematical connection and matched with learning strategy, is expected to improve the quality of learning mathematics.

This research aims to describe and analyze: (1) the effect of mathematics learning with Discovery Learning strategy and Discovery Learning strategy of Information and Communication Technology (ICT) toward mathematics learning outcome, (2) the effect of student's mathematical connection toward mathematics learning outcome, (3) the interaction between learning strategy and student's mathematical connection toward mathematics outcome.

Research Method

The research was conducted in SMP Negeri 2 Kartasura. The type of research is experiment with quasi-experimental design that had a control group, but had no function to control external variables that affect the implementation of the experiment fully (Sugiyono, 2010: 87). The population in this research were all students of class VIII SMP Negeri 2 Kartasura of odd semester of academic year 2015/2016. Sampling

technique use cluster random sampling in order to obtain class VIII A (class control) and VIII C (class experiment). Then the samples tested by t test before each class is given treatment to determine whether the samples have the same mean.

Learning steps of Discovery Learning strategy based on ICT are: (1) Stimulation, teacher presents a problem with PPT (PowerPoint) on the material functions, (2) Problem Statement, teacher lead students to formulate an answer as to the problems that have been given, (3) Data Collection, teachers provide LKS, then the teacher asks students working group to discuss the functions contained in LKS, (4) Data Processing, Teachers lead students working group to solve problems related to functions contained on the worksheet, (5) Verification, teacher asks the students to present the results of the discussion. Then teacher provide feedback or confirmation, (6) Ganeralization, The teacher asks the students to give conclusions about the material that has been taught, (7) Closing, teacher asks the students working on the Post Test contained in PPT.

Learning steps of Discovery Learning strategy are: (1) Stimulation, teacher presents a problem with questions on the material functions, (2) Problem Statement, teacher lead students to formulate an answer as to the problems that have been given, (3) Data Collection, teachers provide LKS, then the teacher asks students working group to discuss the functions contained in LKS, (4) Data Processing, Teachers lead students working group to solve problems related to functions contained on the worksheet, (5) Verification, teacher asks the students to present the results of the discussion. Then teacher provide feedback or confirmation, (6) Ganeralization, The teacher asks the students to give conclusions about the material that has been taught, (7) Closing, teacher asks the students working on the Post Test.

There are two variables in this research that are the dependent variable and independent variables. The dependent variable is mathematics learning outcome and the independent variables are learning strategy and student mathematical connections. Collecting data using test methods to obtain data on students' mathematics outcome and data on students' mathematical connection, and documentation method to get data of students' initial ability (data of Final Examination in even Semester of academic year 2014/2015). Instruments in this research in the form of test to obtain data of students' learning outcome and students' mathematical connection in the mathematics learning

process. Then, the instruments tested before being given to a sample to determine whether the instrument qualifies validity and reliability.

Data analyzed by analysis of variance with two different cell lines. Before data analyzed, conducted prerequisite test using Liliefors method to test the normality and Bartlett method to test the homogeneity of variances. When H_0 is rejected then conducted follow-up of the analysis of variance by multiple comparison test using Scheffe method.

Result And Discussion

Based on the result of samples balance' test can be concluded that the Discovery Learning class and Discovery Learning based on Information and Communication Technology (ICT) class have the same mean before being treated. Support instruments are needed to complete a research. That instruments include instrument of mathematics learning outcome test and instrument of mathematical connection test. From the validity test of learning outcome obtained 20 valid items, while from the validity test of mathematical connection obtained 25 valid items. The instrument that was valid and reliable subsequently given to sample of the research.

Normality test results concluded that each sample comes from a population with normal distribution. While the homogeneity test concluded that two independent variables in this research have same variance (homogeneous). Then the two-way analysis of variance with different cells do. Summary results of two way analysis of variance with different cell shown in table 2.

Table 2. Summary of Two Way ANAVA with Different Cells

| Sources of Variance | JK | DK | RK | F_{obs} | F_{α} | Decision of H_0 |
|-----------------------------|----------|------|----------|-----------|--------------|-------------------|
| Learning Strategy (A) | 474,499 | 1 | 474,499 | 5,151 | 4,03 | H_0 is rejected |
| Mathematical Connection (B) | 3804,463 | 2 | 1902,232 | 20,649 | 3,18 | H_0 is rejected |
| Interaction (AB) | 42,455 | 2 | 21,228 | 0,230 | 3,18 | H_0 is rejected |
| Error | 4882,386 | 53 | 92,121 | - | - | - |
| Total | 9203,804 | 58 | - | - | - | - |

Based on table 2 above obtained the conclusion that in order to test inter-row (A) obtained $F_A > F_{\alpha}$ then H_0 is rejected. It shows that there is a difference between the

effects of Discovery Learning strategy based on Information and Communication (ICT) and Discovery Learning toward mathematics learning outcome. Results of test inter-column (B) obtained $F_B > F_\alpha$, then H_0 is rejected. It shows that there is difference between the effects of mathematical connection' ability of high, medium, and low toward students mathematics learning outcome. Thus, at least there exist two same mean, then conducted multiple comparison test.

The anova calculation result obtained $F_{AB} < F_\alpha$, then the decision is accept H_0 test. It means that there is no interaction between the use of learning strategies with students 'mathematical connection toward students' learning outcome.

Hypothesis test results with a significance level 5% is known there are differences in the effect of the use of learning strategies and students mathematical connections to mathematics learning outcomes. The conditions above can be presented in Table 3.

Tabel 3. Summary of Learning Outcome and Mathematical Connection

| Learning Strategy | Mathematical Connection | | | Average Marginal |
|-------------------|-------------------------|--------|--------|------------------|
| | High | Medium | Low | |
| DL based on ICT | 91,25 | 78,182 | 70 | 79,811 |
| DL | 84,5 | 71 | 66,667 | 74,056 |
| Average Marginal | 87,875 | 74,591 | 68,333 | |

1. First Hypothesis

In the experimental group obtained an average value of mathematics learning outcome about 79.811, while the control group obtained an average value of mathematics learning outcome about 74.056. This means that student learning outcome with Discovery Learning strategy based on ICT is higher than the student learning outcome Discovery Learning strategy.

Discovery Learning strategy based on Information and Communication Technology (ICT) on the subject of the function, teacher gives an overview of the material using media based on ICT before give problems for students to discuss guided by the teacher through research procedures. Therefore, Discovery Learning strategy based on ICT emphasizes students to play an active role in learning process. At the end of the lesson, teacher gives quiz using ICT. Therefore, more students master the material being studied. Thus, students are subjected to Discovery Learning strategiy based on Information and Communication Technology (ICT),

better mastered the material which studied during the lessons. Widayanto (2009) in Nirvana (2013: 385) states that the use of ICT such as PowerPoint (PPT) in learning can enhance students' understanding and skills.

2. Second Hypothesis

The results of comparison test inter-column using Scheffe method shown in Table 3.

Table 4. Summary of Comparison Test Inter-Column

| H_0 | H_1 | F_{obs} | F_{table} | Decision |
|-----------------------|--------------------------|-----------|-------------|-------------------|
| $\mu_{B1} = \mu_{B2}$ | $\mu_{B1} \neq \mu_{B2}$ | 82,327 | 6,36 | H_0 is rejected |
| $\mu_{B1} = \mu_{B3}$ | $\mu_{B1} \neq \mu_{B3}$ | 153,598 | 6,36 | H_0 is rejected |
| $\mu_{B2} = \mu_{B3}$ | $\mu_{B2} \neq \mu_{B3}$ | 15,440 | 6,36 | H_0 is rejected |

Based on table 4. Above obtained the conclusion that: (1) there are differences in the effect of the significant learning outcome between mathematical connections' group of high and medium. By comparing the average marginal of students, can be concluded that the high level of mathematical connections is better than medium level of mathematical connection in students learning outcome. (2) there are differences in the effect of the significant learning outcome between mathematical connections' group of high and low. By comparing the average marginal of students, can be concluded that the high level of mathematical connections is better than low level of mathematical connection in students learning outcome. (3) there are differences in the effect of the significant learning outcome between medium and low mathematical connection's group. By comparing the average marginal of students, can be concluded that the medium level of mathematical connections is better than low level of mathematical connection in students learning outcome.

In this research showed that high level of mathematical connections is better than medium level and low level of mathematical connections, in such a way that students with medium level of mathematical connection is better than low level of mathematical connection in students' learning outcome. It has the same opinion with the results of Arif Widarti (2013) which states that there is difference in students' mathematical connection ability in solving problems.

3. The Third Hypothesis

The result of ANOVA test is $F_{AB} < F_{\alpha}$, then H_0 is accepted, it is mean that there is no interaction between the use of Discovery Learnings strategi based on Information and Communication Technology (ICT) and Discovery Learning strategy based on mathematical connection toward mathematics outcome. In Line with these opinion, Suyanto (2013) stated that use of ICT has positive influence on the progress of the quality of education. Then, the result of Mandur, et al (2013) states that mathematical connection ability influence students learning outcome.

Conclusion

Based on the results and discussion can be concluded that: (1) There is differences between the effects of the use of Discovery Learning strategy based on Information and Communication Technology (ICT) and Discovery Learning strategy toward students' mathematics outcome. Discovery Learning strategy based on Information and Communication Technology (ICT) is better than Discovery Learning strategy. (2) There are differences effect of students' mathematical connections toward mathematics outcome. Students who have a high mathematical connection have higher learning outcome than students who have medium and low mathematical connections. In such a way with students who have a medium mathematical connection have higher learning outcome than students who have low mathematical connections. (3) There is no interaction between learning strategies with a students mathematical connection toward students learning outcome, with $F_{AB} = 0,230$.

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